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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/509,718	10/01/2004	Hyung Joo Kim	61282.00018	4384

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EXAMINER	
MARTIN, PAUL C	
ART UNIT	**PAPER NUMBER**
1657	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/08/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/509,718	KIM ET AL.	
	Examiner	Art Unit	
	Paul C. Martin	1657	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2 and 4* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2 and 4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/18/06,12/13/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claims 2 and 4 are pending in this application and were examined on their merits.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office Action.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/18/06 has been entered.

The objection to Claim 2 due to minor informalities has been withdrawn due to the Applicant's amendments to the Claims filed 09/18/06.

The rejections to Claims 2 and 4 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention have been withdrawn due to the Applicant's amendments to the Claims filed 09/18/06.

Claim Objections

Claim 2 is objected to because of the following informalities: The term "screening" as commonly used in the art, implies a testing process. Replacement with "filtering" is suggested. Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claims 2 and 4 remain rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Nowhere in the instant claims of specification is described what toxic materials are being detected nor what electrochemically active bacteria are being utilized to perform this detection, and therefore one of skill in the art would not have concluded that the inventors were in possession of the claimed invention.

Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 is missing a step which requires the detection of the toxic material. In order to overcome this rejection, it is suggested that a relationship to the detection of toxic material be made; i.e., 'wherein said degree of electrical changes corresponds to the presence of toxic material'.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Evans *et al.* (1998) in view of Kim *et al.* (US 5,976,719).

Evans *et al.* teaches a method for detecting toxic materials in wastewater samples using electrochemically active bacteria by introducing an activated sludge containing electrochemically active bacteria onto an anode electrode to form an enrichment culture (Pg. 449, Column 1, Lines 1-12), which generates and electrochemical signal and determining the electrochemical signals generated from the microbial biosensor after addition of *p*-benzoquinone mediator (Pg. 449, Column 1, Lines 13-35), introducing a wastewater sample containing materials toxic to the electrochemically active bacteria into the biosensor and determining the degree of electrochemical signal changes from the biosensor after introducing the water sample to the biosensor (Pg. 449, Column 1, Lines 35-40 and Pg. 450, Fig. 2 and Pg. 451, Fig. 3).

Evans *et al.* does not teach the screening out of unwanted materials in the water sample, a microbial fuel cell having electrochemically active bacteria in an anode compartment, or the incorporation of water saturated with air into a cathode compartment of the microbial fuel cell to keep a certain potential difference.

Kim *et al.* teaches a mediatorless microbial fuel cell comprising introducing an electrochemically active bacteria isolated from sludge into an anode compartment and the incorporation of an electrolyte saturated with air into the cathode compartment of the microbial fuel cell to keep a certain potential difference (Column 9, Lines 18-60).

Kim *et al.* teaches wherein the electrochemical reactivity of the bacteria and electrodes is determined by cyclic voltammetry, a method used to monitor biosensors and biofuel cells and that the microbial fuel cell utilizes wastewater as a fuel (Column 6, Lines 41-64).

Kim *et al.* teaches that artificial mediators typically used in microbial biofuel cells have such disadvantages as toxicity to the microorganisms and environmental disposal problems (Column 2, Lines 4-12).

It would have been obvious to one of ordinary skill in the art at the time of the instant to combine the method for detecting toxic materials in wastewater samples using an electrochemically active bacterial biosensor as taught by Evans *et al.* above with the mediatorless microbial fuel cell containing electrochemically active bacteria utilizing wastewater as a fuel source as taught by Kim *et al.* above because one of skill in the art would have recognized that the introduction of toxins affecting the electrochemically active bacteria in the wastewater fuel source of Kim *et al.* would generate electrochemical signal changes which can be detected and quantified as per the method of Evans *et al.* above. While neither method teaches the step of filtering out unwanted materials, it would have been obvious to one of ordinary skill in the art to filter incoming water samples to prevent clogging of the downstream systems and maintaining flow efficiency.

One of ordinary skill in the art would have been motivated to combine these two methods because of the advantages taught by Kim *et al.* in using a mediator free microbial fuel cell such as reduced toxicity of the mediator and reduced environmental disposal complications. There would have been a reasonable expectation of success in combining these two methods because both are drawn to the use of wastewater fueled, electrochemically active bacteria derived from sludge in devices for monitoring electrochemical signals.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Evans *et al.* (1998) in view of Kim *et al.* (US 5,976,719) and further in view of Nakamura *et al.* (US 5,160,604) and Shedd *et al.* (US 6,058,763).

The teachings of Kim *et al.* and Evans *et al.* were discussed above.

Neither Evans *et al.* nor Kim *et al.* teaches a device comprising a water sample inlet pump, a first pre-treatment tank for treating the water sample, a personal computer and controlling part for controlling the value of the electrochemical signals and automatically determining toxicity in a water sample, a solenoid valve which changes the flow of the water sample when detecting the entry of toxic materials, or a sample-gathering vessel which intakes and stores the water sample when the entry of toxic materials are sensed.

Nakamura *et al.* teaches a device for detecting toxic materials in water comprising:

An inlet pump (Fig. 2, #32), a first pretreatment tank for pre-treating the water sample (Column 6, Lines 64-68), a microorganism sensor which detects changes in current due to the entry of toxic materials (Fig. 4), and a computer and control circuit which controls the value of the signals and automatically determines the toxicity (Column 8, Lines 58-68 and Column 9, Lines 1-15)

Shedd *et al.* teaches a device for detecting toxic materials in water comprising a solenoid valve (Column 14, Line 1) which changes the flow of the sample when toxic materials are detected (Column 14, Lines 16-25), and a sample-gathering tank which intakes and stores the sample upon detection of toxic substances (Column 11, Lines 12-15)

It would have been obvious to combine the microbial fuel cell device for detecting toxic materials in water samples as taught by Evans *et al.* and Kim *et al.* above with the devices for detecting toxic materials in water samples as taught by Nakamura *et al.* and Shedd *et al.* because one of skill in the art would have recognized the need to automate the flow of wastewater into, through and out of the detection device as a means of increasing the overall efficiency of the detection system. The ordinary artisan would also have recognized that diversion and retention of a contaminated sample would be prudent until further analysis and/or corrective action could be taken.

The ordinary artisan would have been motivated to make these modifications due to the increased efficiency, cost-effectiveness provided and good standard operating practices regarding water-borne toxins. The ordinary artisan would have had a reasonable expectation of success because all of the devices cited above are directed to the detection of toxic materials in water samples.

From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

Response to Arguments

Applicant refers to a representative examples of microorganisms *S. putrefaciens* and *G. sulfurreducens* described in WO 01/04626, and Gil *et al.* which teaches that *S. putrefaciens* is an electrochemically active bacteria and that the properties of electrochemically active bacteria are known in the art (Remarks, Pg. 4, Lines 8-22). The fact that some bacteria are electrochemically active is not in dispute here, however the Applicant's assertion that the instant invention is applicable to any and all electrochemically active bacteria is in question.

The instantly filed specification and claims only contain reference to "electrochemically active bacteria" with no further explanation or description as to what bacteria of the innumerable species thereof, are encompassed by the instantly claimed invention. Further, one of ordinary skill in the art would be subjected to undue amounts of experimentation in the adapting the instant invention to any electrochemically active bacteria. For example, Peschek *et al.* (1985) discloses the electrochemical activity of the bacterium *A. nidulans* varies when grown under aerobic or anaerobic conditions and under conditions of varying pH (Pg. 281, Fig. 4 and Pg. 282, Fig. 5). Thus, one of ordinary skill in the art would have to experiment with selecting those electrochemically active bacteria especially suited to the conditions found in the instant invention. Undoubtedly, there would be species of bacteria which would be inoperable in the instant invention, however no guidance or direction is to be found in the instant specification to ascertaining those specific operable species from those which will not work. Further, no explanation is found as to what "toxic materials" are being detected by these bacteria, toxic materials in the broadest interpretation of the claim could range from plastics to potassium cyanide. Castelli *et al.* (2000) teaches that certain toxic compounds have different toxic and electrochemical effects on aerobic vs. anaerobic species of bacteria (Pg. 548, Table VI).

Therefore, it is not unreasonable that different toxic materials will have varying effects depending on what type of electrochemically active bacteria is selected for use in the instant invention and the instant claim(s) then contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

No Claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul C. Martin whose telephone number is 571-272-3348. The examiner can normally be reached on M-F 8am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jon Weber can be reached on 571-272-0925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Paul Martin
Examiner
Art Unit 1657

12/20/06

PATRICIA LEITH
PRIMARY EXAMINER